

WHAT IS CLAIMED IS:

1. An air passage switching device comprising:

a case for deforming an air passage through which air flows, the case having a first opening and a second opening through which air passes; and

a rotary door that includes a rotation shaft, an outer peripheral door surface separated from a center axial line of the rotation shaft to a radial outside by a predetermined dimension, and two side plates connected to the rotation shaft and end portions of the outer peripheral door surface in an axial direction of the rotation shaft, wherein:

the rotary door has first and second seal parts that are provided on periphery end portions of the side plates and the outer peripheral door surface, the first seal part being arranged at a side of the first opening, and the second seal part being arranged at a side of the second opening;

the rotary door has a door structure angle ( $\theta_d$ ) defined by the first and second seal parts in a rotation direction of the rotary door, and the door structure angle is larger than a door operating angle ( $\theta_m$ ) in which the rotary door is rotatable around the rotation shaft;

the case has a first end seal surface at a position proximate to the first opening and opposite to the second opening, a second end seal surface at a position proximate to the second opening and opposite to the first opening, and first and second middle seal surfaces between the first end seal surface and the second end seal surface in the rotation

direction;

the first and second middle seal surfaces are disposed to be separated from each other in the rotation direction by a predetermined angle that is a difference between the door structure angle and the door operating angle;

when the rotary door is rotated to a first operation position where the first opening is closed, the first seal part press-contacts the first end seal surface, and the second seal part press-contacts the second middle seal surface; and

when the rotary door is rotated to a second operation position where the second opening is closed, the first seal part press-contacts the first middle seal surface, and the second seal part press-contacts the second end seal surface.

2. The air passage switching device according to claim 1, wherein:

the case has first and second ribs protruding to an inner side of the case from an inner surface of the case;

the first and second ribs are separated from each other in the rotation direction;

the first rib has the first middle seal surface at a side of the first seal part of the rotary door; and

the second rib has the second middle seal surface at a side of the second seal part of the rotary door.

3. The air passage switching device according to claim 1, wherein:

the case has a case wall between the first opening and the second opening;

the case wall protrudes inside of the case to form a protrusion portion, and has a wall thickness approximately equal to a wall thickness of the other part of the case;

the first middle seal surface is provided on a wall surface of the protrusion portion, extending in a radius direction of the rotary door, at a side of the first opening; and

the second middle seal surface is provided on a wall surface of the protrusion portion, extending in a radius direction of the rotary door, at a side of the second opening.

4. The air passage switching device according to claim 1, wherein:

the first seal part and the second seal part are made of an elastic material, and are provided to protrude outside from outer peripheries of the outer periphery door surface and the side plates in a lip shape; and

the first seal part and the second seal part are provided to have an approximate V-shape in a cross-section.

5. A vehicle air conditioner having an air passage switching device according to claim 1 that is used for an air-outlet mode switching device, the vehicle air conditioner including a heat exchanger disposed in the case to perform heat exchange with air, wherein:

the air passage is provided so that air from the heat exchanger flows into a passenger compartment of the vehicle; and

the air-outlet mode switching device is disposed in the case downstream of the heat exchanger to change at least a flow direction of air to be blown into the passenger compartment.

6. The vehicle air conditioner according to claim 5, wherein:

one of the first opening and the second opening is a foot opening through which air is blown toward a lower side in the passenger compartment, and the other one of the first opening and the second opening is a communication passage opening through which an upstream side of the communication passage opening communicates with at least one of downstream openings including a face opening through which air is blown toward an upper side of the passenger compartment and a defroster opening through which air is blown toward an inner surface of a windshield of the vehicle.

7. The vehicle air conditioner according to claim 5, wherein:

one of the first opening and the second opening is a face opening through which air is blown toward an upper side of the passenger compartment, and the other one of the first opening and the second opening is a defroster opening through which

air is blown toward an inner surface of a windshield of the vehicle.

8. A vehicle air conditioner having an air passage switching device according to claim 1 that is used for an inside/outside air switching box, wherein:

one of the first opening and the second opening is an inside air introduction port for introducing air inside a passenger compartment of the vehicle into the case, and the other one of the first opening and the second opening is an outside air introduction port for introducing air outside the passenger compartment of the vehicle into the case.

9. An air conditioner for a vehicle having a passenger compartment, the air conditioner comprising:

a case for defining an air passage through which air flows into the passenger compartment, the case having a first opening and a second opening through which air passes;

a heat exchanger disposed in the case to perform a heat exchange with air to be blown into the passenger compartment; and

a rotary door disposed in the case, the rotary door including a rotation shaft, an outer peripheral door surface separated from a center axial line of the rotation shaft to a radial outside by a predetermined dimension, and two side plates connected to the rotation shaft and end portions of the outer peripheral door surface in an axial direction of the

rotation shaft, wherein:

the rotary door has first and second seal parts that are provided on periphery end portions of the side plates and the outer peripheral door surface, the first seal part being arranged at a side of the first opening, and the second seal part being arranged at a side of the second opening;

the rotary door has a door structure angle ( $\theta_d$ ) defined by the first and second seal parts in a rotation direction of the rotary door, and the door structure angle is larger than a door operating angle ( $\theta_m$ ) in which the rotary door is rotatable around the rotation shaft;

the case has a first end seal surface at a position proximate to the first opening and opposite to the second opening, a second end seal surface at a position proximate to the second opening and opposite to the first opening, and first and second middle seal surfaces between the first end seal surface and the second end seal surface in the rotation direction of the rotary door;

the first and second middle seal surfaces are disposed to be separated from each other in the rotation direction by a predetermined angle that is a difference between the door structure angle and the door operating angle;

when the rotary door is rotated to a first operation position where the first opening is closed, the first seal part press-contacts the first end seal surface, and the second seal part press-contacts the second middle seal surface; and

when the rotary door is rotated to a second operation

position where the second opening is closed, the first seal part press-contacts the first middle seal surface, and the second seal part press-contacts the second end seal surface.

10. The air conditioner according to claim 9 wherein:

the first opening and the second opening are provided in the case downstream of the heat exchanger.

11. The air conditioner according to claim 10, wherein:

one of the first opening and the second opening is a foot opening through which air is blown toward a lower side in the passenger compartment, and the other one of the first opening and the second opening is a communication passage opening through which an upstream side of the communication passage communicates with at least one of downstream opening including a face opening through which air is blown toward an upper side of the passenger compartment and a defroster opening through which air is blown toward an inner surface of a windshield of the vehicle.

12. The air conditioner according to claim 10, wherein:

one of the first opening and the second opening is a face opening through which air is blown toward an upper side of the passenger compartment, and the other one of the first opening and the second opening is a defroster opening through which air is blown toward an inner surface of a windshield of the vehicle.

13. The air conditioner according to claim 9, wherein:  
the first opening and the second opening are provided upstream of the heat exchanger; and

one of the first opening and the second opening is an inside air introduction port for introducing air inside a passenger compartment of the vehicle into the case, and the other one of the first opening and the second opening is an outside air introduction port for introducing air outside the passenger compartment of the vehicle into the case.

14. The air conditioner according to claim 9, wherein:  
the case has first and second ribs protruding to an inner side of the case from an inner surface of the case;

the first and second ribs are separated from each other in the rotation direction;

the first rib has the first middle seal surface at a side of the first seal part of the rotary door; and

the second rib has the second middle seal surface at a side of the second seal part of the rotary door.

15. The air conditioner according to claim 9, wherein:  
the case has a case wall between the first opening and the second opening;

the case wall protrudes inside of the case to form a protrusion portion, and has a wall thickness approximately equal to a wall thickness of the other part of the case;



the first middle seal surface is provided on a wall surface of the protrusion portion, extending in a radius direction of the rotary door, at a side of the first opening; and

the second middle seal surface is provided on a wall surface of the protrusion portion, extending in a radius direction of the rotary door, at a side of the second opening.